

DEPARTMENT OF PHYSICS & ASTRONOMY
 UNIVERSITY OF NORTH CAROLINA AT CHAPEL HILL
Procedures Governing the Graduate Student Curriculum

Approved by Department on 28 April, 2017

At the start of the Spring 2017 semester, the Graduate Studies & Affairs Committee (GS&A) was charged by the chair, Christian Iliadis, to modernize the graduate course curriculum. The original questions are listed below in **boldface**, while the committee's recommendations are given in *italics*.

1. Assess the PhD course requirements; do we need to change these? How useful is the requirement that our students take an "out-of-area" course?

Comment: Based on feedback from faculty and students, the committee's goal is to allow for the PhD course requirements to be as flexible as possible.

Recommendation #1: The committee recommends that PhD students complete a total of 27 hours of courses. This includes four required core courses: Classical Mechanics, Statistical Mechanics, Electromagnetism, and Quantum Mechanics I. The remaining 15 credits would be fulfilled by taking five elective courses, agreed upon between the student and their advisor (with out-of-department courses also approved by the Director of Graduate Studies).

Comments:

- Based on a previous faculty decision, there is no out-of-area course requirement.
- The above recommendation does not apply to students admitted with Masters degrees. Such students must complete 18 hours and may take purely electives provided they pass the Doctoral Written Exam (DWE) in all core subjects.
- The 27 hours do not include the TA or First Year Seminars [1-credit hour each].
- An example schedule for first year students is shown in the table. Note there is no requirement that a student complete the core courses in their first year, which provides students additional flexibility with their schedules.

Table 2. Possible 1st year schedule, with four core courses plus two electives.

Fall Semester	Spring Semester
Classical Dynamics PHYS 701 (3)	Stat. Mech PHYS 741 (3)
Math Methods PHYS 631 (3)	E&M PHYS 712 (3)
Quantum Mech. I PHYS 721 (3)	Elective (3)
TA Seminar PHYS 510 (1)	
Grad Seminar PHYS 885 (1)	

2. Can we improve the content of the core courses? Can certain content be removed? Should we include other content? Can material from EM II and QM II be included in EM I and QM I?

Comment: The following recommendations are based on an extensive set of discussions with faculty teaching graduate courses, graduate students, and from an examination of courses that are being offered at many departments around the U.S.

Recommendation #2: We recommend offering Mathematical Methods, as an elective course on an annual basis in the Fall semester. This course would help prepare students for their more advanced courses. A syllabus that takes into account the material being taught in the core courses has been developed for this course. The course would be designated PHYS 631, the existing Mathematical Methods course that is in the catalog but has not been taught in many years. We recommend offering the course in the fall of 2017.

Recommendation #3: We recommend combining limited material from EM I with much of the material currently in EM II as a revised single EM course. A revised syllabus has been developed. This course would be designated PHYS 712 and considered one of the four core courses.

Recommendation #4: It is important to offer an integrated set of materials for the core courses. In particular instructors for the core courses need to follow established, integrated syllabi (minimum topic list consistent with the DWE list of material). Likewise follow-on courses, for example QM II, need to be well coordinated with the earlier course material. The GS&A committee and Department Chair need to annually communicate this to graduate course instructors and these instructors' syllabi for the core courses and PHYS 631 will be reviewed and approved by the GS&A committee.

Comment: The committee had a vigorous discussion on the possibility of combining QM I and QM II. However there was not sufficient time to fully examine all the issues involved, in particular how any changes for the QM I and II would affect the advanced QM and QFT courses. No changes are recommended at this time, but it is suggested that this topic be examined by next year's GS&A Committee.

Comment: The department would no longer offer EM I on a regular basis, but the course number would be kept on the books in case there was an interest in a special offering of electrostatics and magnetostatics.

Action: Updates to PHYS 712 and PHYS 631 need to be submitted to the Registrar.

3. Which electives should we offer regularly on an annual or bi-annual basis?

Comment: The committee reviewed the electives offered at UNC over the past few years and their pre-requisites. It was found that in many instances, the current official course descriptions do not match what is actually being taught. An updated departmental "catalog" of these courses has been compiled and is (being) posted to the Web.

Recommendation #5: We recommend teaching Math Methods (P631), Quantum Mechanics II (P722), Quantum Field Theory I (P822), Stellar Interiors, Evolution, and Populations (A701), Astronomical Data (A719), and the new statistics, data analysis, and numerical methods course (P632) on an annual basis. We further recommend that the department should aim to offer many of the electives on at least a bi-annual basis.

Action: Updates to many of the elective courses need to be submitted to the Registrar.

4. Do we need new electives? Do we have too many elective courses on the same broad subjects? Assess the graduate course offerings of other Physics & Astronomy departments at our peer institutions.

Comment: The committee has drafted suggested guidelines on the number of graduate courses to be offered each semester as well as possible pairing for bi-annual offerings.

Comment: As part of our examination of electives, a number of potential new courses were suggested. This question needs to be addressed by a future GS&A committee in conjunction with decisions on which of the current electives should be offered on a regular bi-annual basis, and on the development of a regularly updated course schedule that goes out for at least a three-year period.

5. Explore the option of creating a new elective course on statistics, data analysis, and numerical methods; our graduate students strongly favor such a course.

Recommendation #6: The committee recommends the establishment of a statistics, data analysis, and numerical methods course. A syllabus for the course has been developed and reviewed. It is suggested that this course is offered during the 2017-2018 academic year.

Recommendation #7: This course fulfills the experimental requirement for theory students.

Comment and Action: This course will use the existing course number, PHYS 632. An update to the course name and description needs to be submitted to the Registrar.

6. Is the current first-year seminar structure efficient? Can we combine the TA seminar and the first-year seminar into a single course, so that the content between these two alternates from week to week?

Comment: The TA and first-year seminars have different enrollments although most of the first year students are enrolled in both courses.

Recommendation #8: For simplicity and efficiency, the committee recommends that the first-year seminar be decoupled from faculty advising and peer mentoring, with advising and mentoring remaining under the purview of the pre-candidacy advising team and the APS Bridge partnership committee. The course instructor for next year's first-year seminar can then independently and directly modify its content and schedule, taking into account student and GS&A committee input and working with the TA seminar instructor(s) to balance the seminar load. If the basic format of the first-year seminar as a one-credit hour course in the fall proves incompatible with the desired modifications, the GS&A committee will revisit this format for subsequent years. The committee raised questions about the logistics of combining the TA and first-year seminars, since some students do not take the TA seminar as first-years but only when they first teach at some later point, but further consideration of this issue is deferred to next year.